

11-304

INSTRUCTION BOOK
FOR
FREQUENCY METER SET I-129-B

MANUFACTURED BY
MUNSTON MFG & SERVICE, INC
ORDER NO.24665-PHILA-49

INSTRUCTION BOOK

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ERRATA

Illustration for fig. 3 should appear on pg. ii as fig. 1.

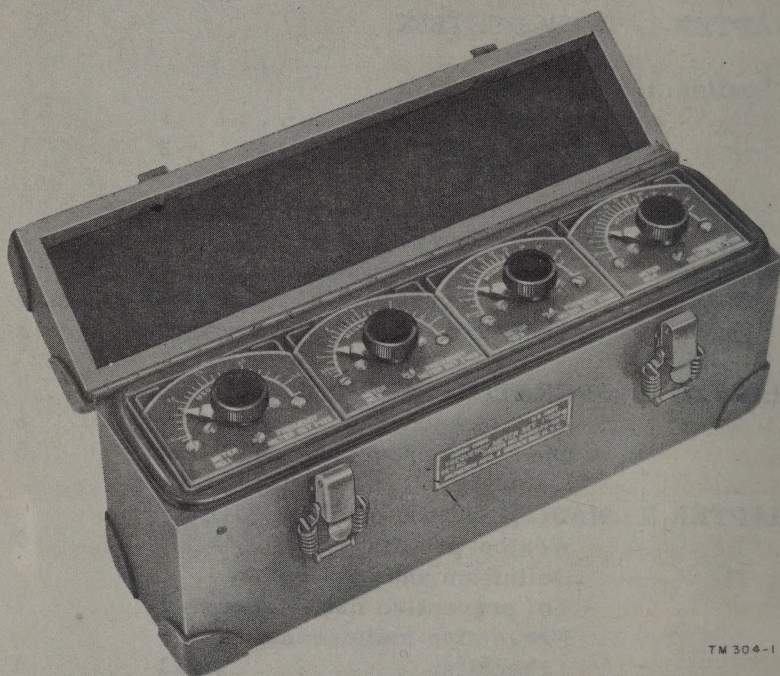
Illustration for fig. 1 should appear on pg. 2 as fig. 2.

Illustration for fig. 2 should appear on pg. 4 as fig. 3.

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TN 304-1

Figure 1. Meter component of Frequency Meter
Set I-129-B in operation.

NOTE: This instruction book will be replaced by a revision of TM 11-304 which, when published, will be listed in SR-310-20-4.

CHAPTER 1

INTRODUCTION

SECTION I. GENERAL

1. SCOPE

a. These instructions are published for the information and guidance of the personnel to whom the equipment is issued. They contain information on the operation and organizational, field, and depot maintenance of the equipment as well as a discussion of the theory of operation. They apply only to Frequency Meter Set I-129-B.

b. The appendix contains a list of current references, including supply catalogs, technical manuals, and other available publications applicable to the equipment.

2. FORMS AND RECORDS

a. The following forms will be used for reporting unsatisfactory conditions of equipment:

NME Form 6, Report of Damaged or Improper Shipment,

DA AGO Form 468, Unsatisfactory Equipment Report.

(1) NME Form 6 (Reports Control Symbol CS GSP-66) (Report of Damaged or Improper Shipment) will be filled out and forwarded as prescribed in AR 700-30 or AFR 67-5.

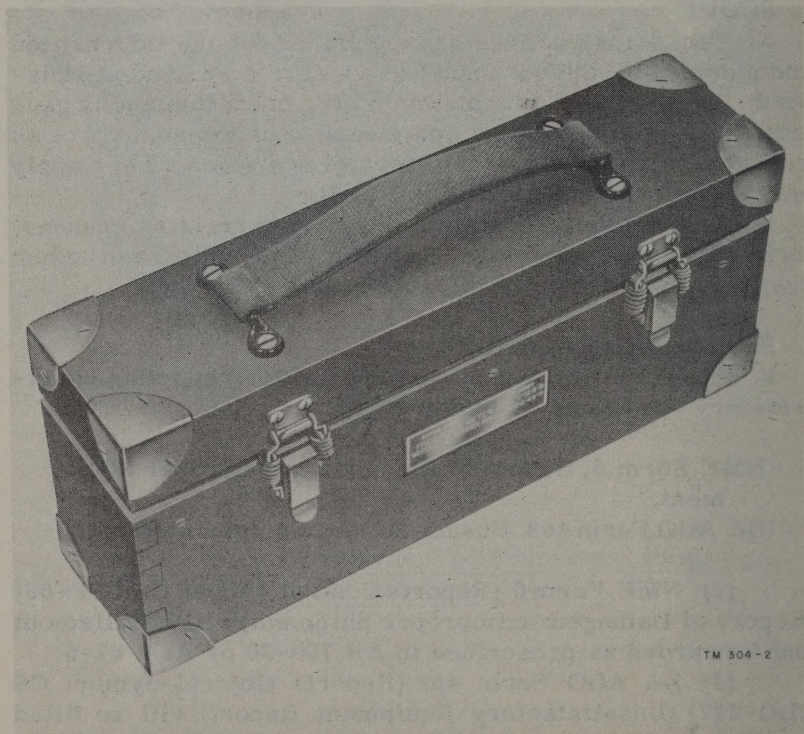
(2) DA AGO Form 468 (Reports Control Symbol CS GLD-247) (Unsatisfactory Equipment Report) will be filled out and forwarded to the Office of the Chief Signal Officer as prescribed in SR 700-45-5.

b. Use other forms and records as authorized.

SECTION II. DESCRIPTION AND DATA

3. GENERAL DESCRIPTION (FIG. 2)

Frequency Meter Set I-129-B is an absorption-type indicating instrument consisting of four frequency meters (par. 6) and is designed to measure the frequency of an oscillator or other r-f (radio-frequency) source. The four meters are carried in a wooden carrying case. The set is used to determine the fundamental frequency of an oscillator or to select the correct harmonic from a harmonic crystal oscillator, frequency doubler, or frequency quadrupler.



TM 304-2

Figure 2. Frequency Meter Set I-129-B.

4. TABLE OF COMPONENTS

Component	Quantity	Dimensions (in.)			Weight (lb)
		Height	Width	Depth	
Meter No. 1	1	4-1/2	3	2-1/2	5/16
Meter No. 2	1	4-1/2	3	2-1/2	5/16
Meter No. 3	1	4-1/2	3	2-1/2	5/16
Meter No. 4	1	4-1/2	3	2-1/2	5/16
Carrying case	1	13-3/8	6-3/8	3-7/8	4-1/8

5. COMPONENT PARTS

Frequency Meter Set I-129-B consists of four absorption-type frequency meters carried in a wooden carrying case (fig. 2). Each frequency meter consists of a coil; a variable capacitor, operated by means of a knob with a pointer; a calibrated dial scale; and a protective dust cover. The case is provided with two trunk fasteners, a webbed carrying handle, and reinforced metal corners.

6. TECHNICAL CHARACTERISTICS

Over-all range of Frequency Meter

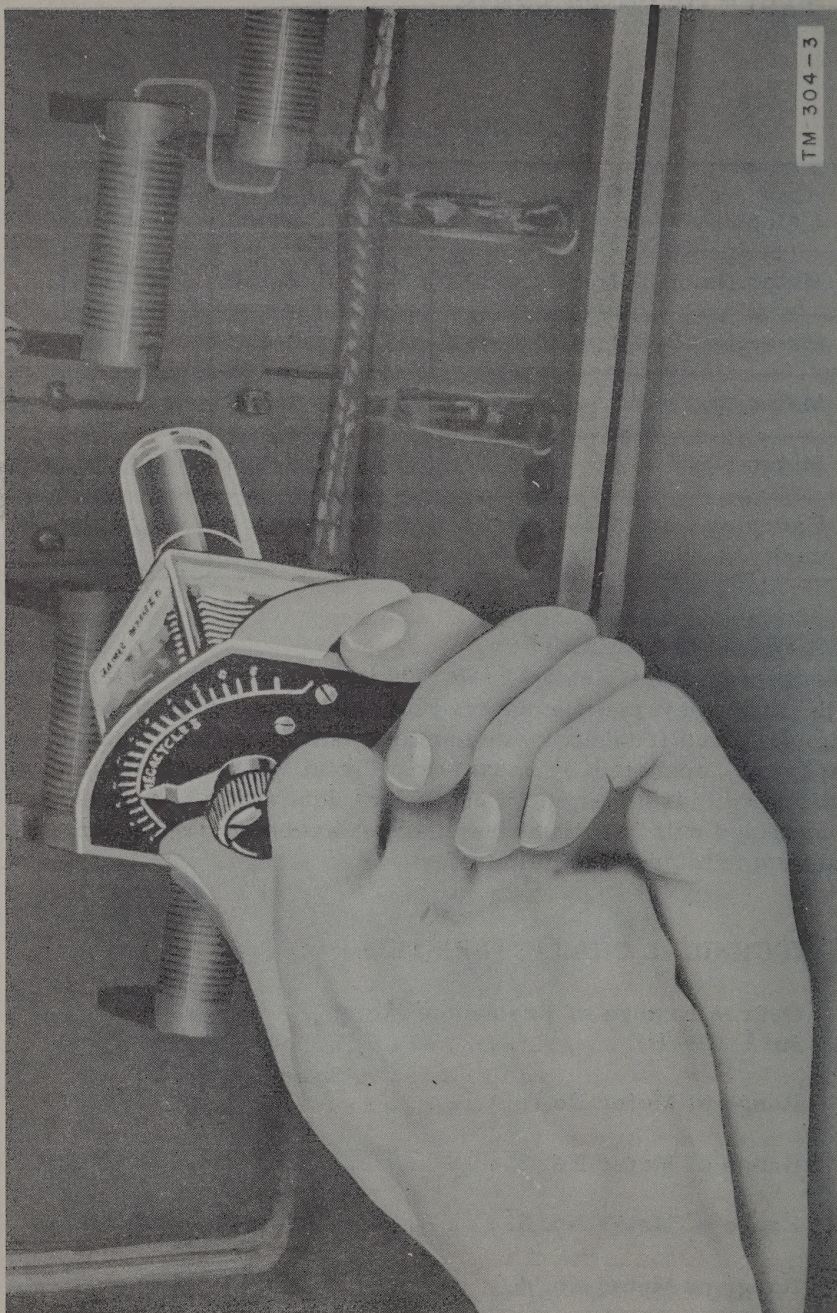
Set I-129-B 1.5 - 41 mc

Range of Meter No. 1. 1.5 - 3.5 mc

Range of Meter No. 2. 3.5 - 8 mc

Range of Meter No. 3. 8 - 18.5 mc

Range of Meter No. 4. 18 - 41 mc



TM 304-3

Figure 3. Frequency Meter Set I-129-B, carrying case.

CHAPTER 2

OPERATING INSTRUCTIONS

7. CONTROL KNOB

The control mounted on the instrument panel is used to resonate the frequency meter to the frequency of the r-f equipment under measurement. This control consists of a pointer knob and a calibrated scale for reading the rf.

8. OPERATING PROCEDURE

a. If the approximate frequency of the circuit under measurement is known, select the frequency meter of the proper frequency range (par. 6).

b. Connect a milliammeter of suitable range in either the plate or grid circuit of the oscillator circuit whose frequency is to be measured.

c. Couple the frequency meter to the tank coil of the oscillator circuit by holding the coil end of the meter near the tank coil of the oscillator circuit (fig. 1). Grasp the sides of the meter, marked HOLD HERE, with the thumb and forefinger of one hand. Using the other hand, turn the knob of the meter until a sharp rise (or dip) in current reading is seen on the milliammeter.

NOTE: Do not couple the frequency meter too closely. When a frequency is coupled too closely, the indication will be very broad and incorrect. Couple the frequency meter to the circuit under test as loosely as possible while still retaining a sharp rise or dip indication on the milliammeter in the circuit under measurement.

d. When the point of maximum rise or dip (needle deflection) of the meter is found, couple the frequency meter more loosely until the change in the indication on the meter is barely perceptible. The reading on the frequency meter

scale at this point is the fundamental frequency of the resonant circuit in the absorption frequency meter and therefore the frequency of the power in the circuit under measurement.

e. When checking the frequency of a circuit in a receiver or transmitter where other circuits are quite near the circuit under test, be careful to couple the frequency meter only to the desired circuit. The maximum external field of any coil is at the end of the coil. To be certain that the frequency meter is coupled only to the desired circuit, be careful to align the coil on the frequency meter with the coil in the circuit under test as much as possible. This will allow the maximum pick-up from the circuit under test and the minimum coupling to other circuits. Read the frequency on the meter dial scale opposite the indicating line of the pointer.

f. When the approximate frequency of the circuit under test is unknown, start with the frequency meter of the lowest range (par. 6). The lowest frequency at which indication of resonance is obtained is either the fundamental frequency of the circuit under measurement or a harmonic of it, if the fundamental frequency is below the range of the frequency meter. If no indication is obtained on any of the four meters, the frequency of the circuit under test is either higher than 41 mc (megacycles) or lower than 1.5 mc, and the strength of the harmonic is too low to be measured or the frequency meter has not been held close enough to the circuit under test.

CAUTION: Be careful when making frequency measurements on transmitters. If the frequency meter is coupled too closely to circuits of large power, sufficient voltage may build up to cause permanent damage to the frequency meter or the capacitor in the meter may arc over. Hold the frequency meter by the thumb and forefinger at the sides of the meter marked HOLD HERE (fig. 1). Keep stray capacity and hand capacity to the frequency meter at a minimum for most accurate frequency measurements.

CHAPTER 3

MAINTENANCE INSTRUCTIONS

9. WEATHERPROOFING

a. GENERAL. Frequency Meter Set I-129-B, when operated under severe climatic conditions such as prevail in tropical, arctic, and desert regions, requires special treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials used in the construction of the converter.

b. TROPICAL MAINTENANCE. A special moisture-proofing and fungiproofing treatment has been devised, which, if properly applied, provides a reasonable degree of protection. (Frequency Meter Set I-129-B has been tropicalized during manufacture.) This treatment is fully explained in TB SIG 13 and TB SIG 72.

c. WINTER MAINTENANCE. Special precautions necessary to prevent poor performance or total operational failure of equipment in extremely low temperatures are fully explained in TB SIG 66.

d. DESERT MAINTENANCE. Special precautions necessary to prevent equipment failure in areas subject to extremely high temperatures, low humidity, and excessive sand and dust are fully explained in TB SIG 75.

10. DEFINITION AND IMPORTANCE OF PREVENTIVE MAINTENANCE

a. DEFINITION. PM (preventive maintenance) is work performed on equipment, usually when it is not in use, to keep it in good working condition so that break-downs and needless interruptions in service will be kept at a minimum. The object of PM is to eliminate the need for trouble shooting and repair.

b. IMPORTANCE. Since the failure or inefficient operation of even one component may cause the break-down of the entire equipment, the importance of PM is obvious. Operators must maintain equipment placed in their charge in such condition that it will work at top efficiency at all times.

11. PREVENTIVE MAINTENANCE CHECKLIST

The following checklist shows PM procedures for Frequency Meter Set I-129-B. The list contains information on what to check, when to check, how to check, and precautions to be taken.

Item No.	What to check	When to check	How to check	Precautions
1	Screws, capacitor plates. Connections. Dust covers.	Quarterly	Inspect for loose screws and mountings; broken connections and frayed insulation; broken or cracked panel or dust cover.	
2	Calibration.	Semi-annually	(Refer to par. 14.)	Do not attempt to calibrate unless authorized.

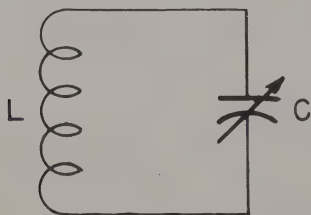
CHAPTER 4

FIELD AND DEPOT MAINTENANCE INSTRUCTIONS

NOTE: The repair instructions that follow are to be used by field and depot maintenance personnel in the location and repair of troubles that may develop in Frequency Meter Set I-129-B. The scope of repairs that may be performed by any unit having field or depot maintenance responsibility is limited only by the tools and test equipment available and by the skill of assigned personnel. Maintenance parts are not stocked for the individual meters (par. 13).

12. GENERAL FUNCTIONING OF EQUIPMENT

Frequency Meter Set I-129-B consists of four absorption-type frequency-meters. Each meter consists of a coil and a shunting variable capacitor (fig. 4). In any combination of inductance and capacitance, there is one particular frequency at which the inductive and capacitive reactances are equal. The reactances are opposite in effect and cancel each other; the net reactance is zero; and only the resistance of the circuit impedes the flow of current. The frequency at which this occurs is known as the resonant frequency. The fre-



TM 304-4

Figure 4. Frequency Meter Set I-129-B,
schematic diagram.

quency meter is then resonating at the frequency of the circuit being measured and is tuned to the same frequency. When the frequency meter is coupled to a circuit having power in it and is tuned to the resonant frequency of that circuit, the meter absorbs a small amount of power from the circuit. This absorption shows up as a dip or sharp rise on the indicating device connected to the circuit under test (par. 8a). The point at which this change occurs, as indicated on the frequency dial, is the frequency of the circuit being measured.

13. INSPECTING AND CLEANING

The four absorption-type meters comprising Frequency Meter Set I-129-B should be inspected for broken leads, deterioration of materials, and condition of the dust cover (fig. 1). The dust cover may be removed for cleaning but under no circumstances should an attempt be made to change the capacitor or the coil, as this will change the calibration of the meter. If inspection discloses breakage of a capacitor plate, coil winding wire, or coil form, the entire unit should be replaced. If inspection discloses shorted capacitor plates, the meter must be calibrated (par. 14).

14. CALIBRATING FREQUENCY METER SET I-129-B

NOTE: Recalibration of this test set should not be attempted by unauthorized personnel.

To calibrate Frequency Meter Set I-129-B, use any of the Frequency Meter Sets SCR-211 covered in TM 11-300 as a frequency standard, any receiver described in TM 11-850 which covers the frequency range of the absorption meters in the test set, a 0.001-mf (microfarad) capacitor, and an output meter equal or similar to any of the voltohmmeters covered in TM 11-2613.

a. Set the receiver for MVC (manual volume control). Turn the ALIGN INPUT control to the right, and set the CW-OSC switch to ON.

b. Turn VOL control to the left, to minimum.

c. Connect the output meter to the PHONES 2ND AUDIO jack of the receiver. Use the 0-15 range of the output meter.

d. Using a short length of wire, connect the frequency standard to the receiver antenna terminal, through the

0.001-mf capacitor. Make a two or three turn coil (1-1/2 inches in diameter) in series with the antenna lead of the receiver. Ground the frequency standard chassis to the receiver chassis.

e. Select any convenient frequency near the h-f (high-frequency) end of the absorption meter under check. Tune the frequency standard to this frequency. Tune the receiver to the same frequency.

f. Adjust the receiver VOL control so that the output meter reads about 1/4 scale.

g. Turn the CW-OSC ADJUST control on the receiver for maximum deflection on the output meter. Now readjust the VOL control for a 10-volt reading on the output meter.

h. Hold the absorption meter by the thumb and forefinger (fig. 3).

i. Couple the absorption meter loosely (at least 1 or 2 inches, preferably more) to the coil in the receiver antenna lead.

j. Tune the absorption meter toward the h-f end until a sharp dip is noted on the output meter. If the output meter should rise rather than dip, the absorption meter is either coupled too closely to the pick-up coil, or the receiver r-f gain is set too high. If the output meter does not move, decrease the output of the frequency standard, increase the gain of the receiver, and retune the absorption meter.

k. If the output meter still does not move, place the absorption meter closer to the pick-up coil, then move the absorption frequency meter away from the pick-up coil until the dip in the output meter is barely perceptible.

l. Read the frequency on the absorption meter scale opposite the indicating pointer. It should be within +3 percent of the frequency to which the frequency standard is tuned. If these requirements are not met, the unit requires recalibration.

m. Repeat the procedures in subparagraphs e through k above at the low-frequency end points of the range and at two or more intermediate points. If one or more of the points checked is more than 3 percent in error, check the measurement to be certain that both the frequency standard and the receiver are tuned to the desired frequency.

n. To recalibrate one of the frequency meters proceed as follows:

(1) Turn the knob until the rotor and stator plates are fully meshed. The pointer should now point to the horizontal line at the left of the frequency meter.

(2) If the pointer does not point to the horizontal line, loosen the pointer setscrew at the rear of the knob.

(3) Hold the knob so that the rotor and stator plates are exactly fully meshed and move the pointer so that it points to the horizontal line.

(4) Tighten the pointer setscrew.

(5) Repeat the procedures in subparagraphs e through k above, to determine whether further adjustment is required.

(6) If the pointer indicates a frequency higher than the selected frequency, remove the dust cover (fig. 1) and move the small plate at the rear of the stator closer to the stator plate.

(7) Replace the dust cover and repeat the procedure in subparagraph (1) above. If the pointer indicates a frequency lower than the desired frequency, remove the dust cover and move the small plate at the rear of the stator farther from the stator plate. Replace the dust cover and repeat the procedure in subparagraph (1) above.

(8) Repeat the procedures in subparagraphs (6) and (7) above until the absorption-type frequency meter is accurate.

o. After the required adjustments have been made, recheck the calibration by repeating the directions in subparagraphs e through m above.

CAUTION: Never bend the rotor or stator plates of the capacitor.

CHAPTER 5

DEMOLITION TO PREVENT ENEMY USE

15. METHODS OF DEMOLITION

a. SMASH. Use sledges, axes, handaxes, pickaxes, hammers, crowbars, heavy tools.

b. CUT. Use handaxes, axes, machetes.

c. BURN. Use gasoline, kerosene, oil, flame throwers, incendiary grenades.

d. EXPLODE. Use firearms, grenades, TNT.

e. DISPOSE. Bury in slit trenches, fox holes, other holes. Throw in streams. Scatter.

NOTE: Use anything immediately available for destruction of this equipment.

16. DESTRUCTION OF COMPONENTS

When ordered by the commander, destroy this equipment to prevent the enemy from using or salvaging the equipment.

a. Smash (par. 15a) panel, dust cover, rotor plates, stator plates, etc.

b. Cut (par. 15b) all wiring.

c. Burn (par. 15c) all instruction books, circuit diagrams, insulation, etc.

d. Bury or scatter (par. 15e) all remaining parts of the equipment.

DESTROY EVERYTHING

APPENDIX

REFERENCES

NOTE: For availability of items listed, check SR 310-20-3 for field manuals, training circulars, training aids, Army training programs, JANAP's, Tables of Organization and Equipments (T/O&E's), Tables of Allowances (T/A's), and Tables of Basic Allowances (T/BA's). Check SR 310-20-4 for technical manuals, technical bulletins, supply bulletins, modification work orders, and Changes. Check Department of the Army Catalog SIG 1 for Signal Corps supply catalog pamphlets.

1. PUBLICATIONS

TM 1-455	Electrical Fundamentals
TM 11-5026	Test Equipment IE-9-C
TM 38-650	Basic Maintenance Manual

2. ARMY REGULATIONS

AR 380-5	Safeguarding Military Information
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3. SUPPLY PUBLICATIONS

SB 11-47	Preparation and Submission of Requisitions for Signal Corps Supplies
SB 11-64	Maintenance Equipment Replenishment
SB 11-76	Signal Corps Kit and Materials for Moisture- and Fungi-Resistant Treatment

4. PAINTING AND PRESERVING

TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment
TB SIG 66	Winter Maintenance of Signal Equipment
TB SIG 75	Desert Maintenance of Ground Signal Equipment
TB SIG 123	Preventive Maintenance Practices for Ground Signal Equipment

5. PACKAGING AND PACKING INSTRUCTIONS

a. JOINT ARMY-NAVY PACKAGING SPECIFICATIONS

JAN-D-169	Desiccants, Activated
JAN-P-100	General Specification
JAN-P-106	Boxes, Wood, Mailed
JAN-P-116	Preservation, Methods of
JAN-P-125	Barrier-Materials, Waterproof, Flexible
JAN-P-131	Barrier-Material, Moisture-Vaporproof, Flexible

b. U.S. ARMY SPECIFICATIONS

100-2E	Marking Shipments by Contractors (and Signal Corps Supplement thereto)
100-14A	Army-Navy General Specification for Packaging and Packing for Overseas Shipment

c. SIGNAL CORPS INSTRUCTIONS

720-7	Standard Pack
726-15	Interior Marking

